Journal of Tropical Biodiversity and Biotechnology
Volume 04, Issue 01 (2019): 18 — 23
DOI: 10.22146/jtbb.36652

Research Article

Species Diversity and Potential Use of Asteraceae in Tawangmangu, Karanganyar Regency, Central Java

Mutiara Fauziana[1], Ratna Susandarini[1]*
1) Faculty of Biology, Universitas Gadjah Mada, Jl. Teknika Selatan, Sekip Utara, Yogyakarta, Indonesia, 55281

*Corresponding author, email: ratna-susandarini@ugm.ac.id

Keywords:
species Asteraceae, ethnobotany, Tawangmangu

Article history:
Submitted 02/07/2018
Revised 21/01/2019
Accepted 01/02/2019

ABSTRACT
Asteraceae is a group of plants with high species diversity, with about 25.000 species become members of this family worldwide. This family has many potential uses such as medicinal plants, ornamental plants and weeds. Tawangmangu is an area with unspoiled environmental conditions, where Asteraceae plants are found either wildly or deliberately cultivated in this area. This study aims to determine species diversity of Asteraceae and their potential use. This study was conducted in 5 villages namely Plumbon, Nglebak, Karanglo, Tawangmangu and Kalisoro. The samples were collected with random sampling method, while information on potential use of Asteraceae was gathered from literature studies and interviews with local people. Results of this study are expected to be basic data of species diversity as well as to provide reference of their potential use. A total of 32 species were found on various habitat, include roadside, home yard, riparian of river, in irrigation canal, and on agricultural landscape. The specimens found were all have potential as medicinal plants, with some wild plants were commonly known as weeds, many others were having potential as ornamental plants.

INTRODUCTION
Asteraceae is a family of Angiosperms with the largest number of species include 1250-1300 genus and 20,000-25,000 species. Asteraceae are distributed worldwide and almost in all habitats (Bhattacharyya & Johri, 1998). There are many potential use of Asteraceae, from medicinal plants, ornamentals plants, and weeds. Some Asteraceae members are widely known as weeds, such as *Ageratum conyzoides*, *Blumeamollis*, *Ecliptaprostrata*, *Erigeron bonariensis*, and *Tridax procumbens*. Meanwhile, some Asteraceae species has a distinctive and beautiful flowers, and used as ornamental plants, Some such as *Aster*, *Calendula*, *Chrysanthemum*, *Dahlia*, *Helianthus* and *Helichrysum*. Potential uses of Asteraceae species as medicinal plant were also found in some species of Asteraceae, as in *Artemisia cina* to overcome the worms in the intestine (Bhattacharyya &Johri, 1998). *Galinsoga parviflora* is an important member of its genus. Various extracts and chemical compounds of the plant have shown antibacterial, antifungal, antioxidant, cytotoxic, anti-inflammatory, urease, α-glucosidase, hepatoprotective, nematicidal and hypoglycaemic activities. Its phytochemical composition indicates the presence of flavonoids, aromatic esters, caffeic acid derivatives, diterpenoids and phenolic acid derivatives (Ali *et al.*, 2017).

Tawangmangu is an as famous recreational destination area in Central Java. This area has many landscape, include roadside, home yard, riparian of river, irrigation canal, and on agricultural landscape such as rice field area and cultivation area of ornamental plants. Agricultural landscape and environmental conditions are still natural, therefore many plants grow wild and well cultivated. The inventory studies of plants with various potentials is important for monitoring biodiversity especially for taxa with high species diversity like Asteraceae. In a case of Asteraceae in Tawangmangu, an actual data on species diversity need to be updated regularly since the study area is a favorite tourist destination which face the threath habitat loss due to changes in land use.

MATERIALS AND METHODS

Materials

The materials used in this study were plant samples collected from 5 villages in Tawangmangu, alcohol 70%, plaster, label, plastic sample, yarn, rope, stationery, herbarium envelope, board, and cardboard. The tools used in this study were garden scissors, oven, sprayer, camera, and identification books.

Methods

Data were taken in 5 villages: Plumbon, Nglebak, Karanglo, Tawangmangu and Kalisoro. Plant specimens were collected by random sampling method. The specimens were documented by take photograph of whole plant and its habitat before being preserved into dry herbaria. Identified based on morphological character using an electronic data literatures and identification books. Species description were prepared based on observation on plant species. Potential use of Asteraceae species were collected from interview with local people and information from relevant literatures. The interview with local people was designed to collect the primary data on the local use of each Asteraceae species found in the study area, as well as documenting their local names and methods of use. The results obtained were presented as species description and information on their potential use.

Table 1.Species diversity of Asteraceae family and their potential use

No.	Species	Local Name	Potential Use		
			Medicinal	Ornamental	Weeds
1.	*Galinsoga parviflora* Cav.	Loseh	+	-	+
2.	*Sphagneticola trilobata* (L.) Pruski	Wedelia	+	+	+
3.	*Acmella radicans* (Jacq.) R.K. Jansen	Jontang	+	-	+
4.	*Porophyllum rudale* (Jacq.) Cass.	Ketumbar bolivia	+	-	+
5.	*Crassocephalum crepidioides* (Benth.) S. Moore	Sintrong	+	-	+
6.	*Tagetes erecta* L.	Kenikir, Tai Kotok, Tai Ayam	+	+	-
7.	*Callistephus chinensis* (L.) Ness	Aster Cina	+	+	+
8.	*Cosmos sulphureus* Cav.	Kenikir	+	+	-
9.	*Ageratum conyzoides* L.	Bandotan	+	+	+
10.	*Bidens pilosa* L.	Ketul	+	-	+
11.	*Senecio vulgaris* L.	-	+	-	+
12.	*Conyza bonariensis* (L.) Cronquist	Jalantir	+	-	+
13.	*Cosmos caudatus* Kunth.	Kenikir	+	+	-
14.	*Emilia sonchifolia* L.	Jombang	+	+	+
15.	*Synedrella nodiflora* L.	Jontang Kuda	+	-	+
16.	*Acmella paniculata* (Wall. ex DC.) R.K. Jansen	Jontang	+	-	+
17.	*Youngia japonica* (L.) DC.	-	+	-	+
18.	*Pseudelephantopus spicatus* (B.Jussreu x Aublet) C. F. Baker	-	+	-	+
19.	*Austroeupatorium inulifolium* (Kunth.) R.M. King & H. Rob	Kirinyuh	+	-	+
20.	*Erigeron karvinskianus* DC.	-	+	+	+
21.	*Dahlia* sp.	Dahlia	+	+	-
22.	*Tithonia diversifolia* (Hemsl.) A. Gray	Kembang Bulan, Tanaman Insulin	+	+	+
23.	*Taraxacum officinale* (L.) Weber ex F.H.Wigg	Dandelion	+	+	+
24.	*Chrysanthemum* sp.	Krisan	+	+	-
25.	*Helianthus annuus* L.	Bunga Matahari	+	+	-
26.	*Zinnia* sp.	Bunga Kertas	+	+	-
27.	*Conyza sumatrensis* (Retz.) E. Walker	Jalantir	+	-	+
28.	*Tagetes patula* L.	Kenikir	+	+	-
29.	*Stokesia laevis* (Hill) Greene	Aster	+	+	-
30.	*Melampodium paludosum* Kunth.	Matahari Kecil	+	+	-
31.	*Elephantopus scaber* Linn.	Tapak Liman	+	-	+
32.	*Sonchus arvensis* L.	Tempuyung	+	+	+

Figure 1. Speciments of Asteraceae: *Galinsoga parviflora* (1), *Sphagneticola trilobata* (2), *Acmellar adicans* (3), *Porophyllum rudale* (4), *Crassocephalum crepidioides* (5), *Tageteserecta* (6), *Callistephuschinensis* (7), *Cosmos sulphurous* (8), *Ageratum conyzoides* (9), *Bidens pilosa* (10), *Senecio vulgaris* (11), *Conyza bonariensis* (12), *Cosmos caudatus* (13), *Emilia sonchifolia* (14), *Synedrella nodiflora* (15), *Acmella paniculata* (16), *Youngia japonica* (17), *Pseudelephantopus spicatus* (18), *Austroeupatorium inulifolium* (19), *Erigeron karvinskianus* (20), *Dahlia* sp. (21), *Tithonia diversifolia* (22), *Taraxacum officinale* (23), *Chrysanthemum* sp. (24), *Helianthus annuus* (25), *Zinnia* sp. (26), *Conyza sumatrensis* (27), *Tagetes patula* (28), *Stokesia laevis* (29), *Melampodium paludosum* (30), *Elephantopus scaber* (31), *Sonchus arvensis* (32).

Table 2. Asteraceae medicinal use

No.	Species	Medicinal Use
1.	*Galinsoga parviflora* Cav.	Antibacterial, antifungi, antioxidants, antiinflammatory, urease, alpha glucosidase, protection of liver damage and as nematicidal (Ali *et al.*, 2017).
2.	*Sphagneticola trilobata* (L.) Pruski	Streamlines urination, headache, cough, malaria, diarrhea and stomachache (Hidayat *et al.*, 2008).
3.	*Acmella radicans* (Jacq.) R.K. Jansen	Stammering, cold, fever, and cough, rheumatism, scabies, psoriasis, wounds, and purgative (Rahman *et al.*, 2016).
4.	*Porophyllum rudale* (Jacq.) Cass.	Anti-inflammatory and rheumatism (Lima *et al.*, 2011).
5.	*Crassocephalum crepidioides* (Benth.) S. Moore	Antimicrobial, anti-diabetic, antiinflammatory and blood pressure regulation (Adjatin *et al.*, 2013).
6.	*Tagetes erecta* L.	Constipation, lung disease, toothache, wounds, swelling, intestinal worms, stomachache, bloating and liver disease (Mursito & Prihmantoro, 2011).
7.	*Callistephus chinensis* (L.) Ness	Anti-diabetic (Zhang *et al.*, 2013).
8.	*Cosmos sulphurous* Cav.	Malaria (Botsaris, 2007).
9.	*Ageratum conyzoides* L.	Dysentery, diarrhea and injury (Hidayat *et al.*, 2008).
10.	*Bidens pilosa* L.	Tumors, inflammation, diabetes, digestive disorders, hypertension and cardiovascular disorders (Bartolome *et al.*, 2013).
11.	*Senecio vulgaris* L.	Acne, cold, colic, diarrhea, dysmenorrhea, epilepsy, fever, headache, infection, inflammation, kidney problem, lung problem, rheumatism, tuberculosis danwounds (Raybur, 2007).
12.	*Conyza bonariensis* (L.) Cronquist	Intestinal troubles, diarrhea, rheumatism, diuretic, infection from wounds, ringworm, sore throatand stomachache (Quattrocchi, 2016).
13.	*Cosmos caudatus* Kunth.	Antimicrobial, antifungi, diabetes, hypertension, inflammation, and bone-protective (Cheng *et al.*, 2015).
14.	*Emilia sonchifolia* L.	Exuviate urine (Simanjuntak, 2017).
15.	*Synedrella nodiflora* L.	Sore legs, headaches, earaches, stomachaches and rheumatism (Adjibode *et al.*, 2015).
16.	*Acmella paniculata* (Wall. ex DC.) R.K. Jansen	*Stammering*, stomachaches, cough and cold (Quattrocchi, 2016).
17.	*Youngia japonica* (L.) DC.	Antioxidants, analgesic, anti-inflammatory and anti-depressant (Munira *et al.*, 2018).
18.	*Pseudelephantopus spicatus* (B.Jussreu x Aublet) C. F. Baker	Cough, headache, antipyretic, erysipelas, skin infection, colic and diarrhea (Ebadi, 2006).
19.	*Austroeupatorium inulifolium* (Kunth.) R.M. King & H. Rob	Cold, cough, regulating fertility (Quattrocchi, 2016).
20.	*Erigeron karvinskianus* DC.	Indigestion, enteritis, epidemic hepatitis, and hematuria (Rajalakshmi *et al.*, 2016).
21.	*Dahlia* sp.	Diabetes (Hidayat *et al.*, 2008).
22.	*Tithonia diversifolia* (Hemsl.) A. Gray	Anti-diabetic
23.	*Taraxacum officinale* (L.) Weber ex F.H.Wigg	Diseases of liver, bile, rheumatism, anemia and diabetes (Supriyatna *et al.*, 2014).
24.	*Chrysanthemum* sp.	Fever, antibiotics, anti-inflammatory, hypotensive and purification the blood (Wijayakusuma, 2000).
25.	*Helianthus annuus* L.	Dysentery, rheumatism and urinary tract infections (Hidayat *et al.*, 2008).
26.	*Zinnia* sp.	Dysentery, gonorrhea, ulcers and sore nipples (Redaksi Agro Media, 2008).
27.	*Conyza sumatrensis* (Retz.) E. Walker	Back pains, diarrhea, dysentry, pimples, postpartum pains, stomache, toothache (Njoroge *et al.*, 2004).
28.	*Tagetes patula* L.	Antiseptic, diuretic and blood purifier (Munhoza *et al.*, 2014).
29.	*Stokesia laevis* (Hill) Greene	Contain Dehydrocostus lactone (Wahlberg *et al.*, 2012). Dehydrocostus lactone for anti-inflammatory and anti-cancer (Wang et *al.*, 2017).
30.	*Melampodium paludosum* Kunth.	Fever, malaria, flatulence, stomachache, colics, joint pain, muscular pain, palpitation,vertigo, rheumatism, jaundice, anuria, diuretic (Botsaris, 2007).
31.	*Elephantopus scaber* Linn.	Antimicrobial, hepatoprotective, antioxidant, antidiabetic, anti-inflammatory, analgesic, antiasthamatic, antiplatelet, anticancer and wound healing properties (Chatterjee & Mukherjee, 2014).
32.	*Sonchus arvensis* L.	Uric acid, kidney stones, bladder stones, diuretics, swelling, cough, asthma, fever, inflammation and potency as a good antioxidant (Putra *et al.*, 2013).

RESULTS AND DISCUSSION

Based on the identification of plant samples using morphological character, 32 species were recognized from study area. These species were collected from various habitats, include roadside, home yard, riparian of river, in irrigation canal, and on agricultural landscape such as rice field area and cultivation area of ornamental plants. The species of Asteraceae collected in this study is presented in Figure 1, and their potential use was listed in Table 1.

The Asteraceae species found as wild plants were commonly known as weeds, while species intentionally grown for the aesthetic interests of the yard and cut flowers were plants that have interesting organs, such as flowers with attractive color, size and shape. All samples found in this study were known by local people as having potential as medicinal plants. These plants were used for the treatment of various diseases such as diabetes, cold, fever, cough, and diarrhea. Some species were known as crop plants and consumed by local people as complementary to the daily food supplements. *Cosmos caudatus*, *Emilia sonchifolia* and *Bidens pilosa* are usually used by local people as a complement to vegetables and also used by the community as medicinal plants as well.

There are some species commonly used by local people of Tawangmangu as medicinal plants such as *Ageratum conyzoides* for treating skin disease, *Bidens pilosa* for cough and cold, *Cosmos caudatus* for hypertension, *Emilia sonchifolia* for relieving cold, *Tithonia diversifolia* as anti-diabetic, *Elephantopus scaber* for fever and cough, and *Sonchus arvensis* for fever, hypertension and gout. The information on the potential use of those plants as traditional medicine need to be proved scientifically, and thus open the opportunity for research in the medicinal properties of the plants. These information collected from interview with local people might be used as basis for further study and on the phytochemistry and pharmacognosy of the plants. Short description on potential use of Asteraceae species as medicinal plants found in this study is listed in Table 2.

Based on Table 2, it is clear that Asteraceae species collected in this study has an important role in the health aspect for the local community, but its utilization is not maximal because lack of knowledge.The knowledge of local people about potential use of Asteraceae species as medicinal plants base on heredity. The potential of Asteraceae as a medicinal plants found in Tawangmangu has to be explored based on scientific experience and literature studies, so that the local community of Tawangmangu could optionally use their potential for the benefit.

CONCLUSION

Based on the number of species found, it could be hosted that species diversity of Asteraceae in Tawangmangu is high. Cosmopolitan distribution were supported the diversity of Asteraceae species in Tawangmangu.

ACKNOWLEDGMENT

This study was financially supported by the BPPTNbh Research Grant for Academic Staff from the Faculty of Biology UGM granted for the second author.

REFERENCES

Adjatin, A., A. Dansi, E. Badoussi, Y.L. Loko, M. Dansi, P. Azokpota, F. Gbaguidi, H. Ahissou, A. Akoègninou, K. Akpagana, & A. Sanni, 2013, Phytochemical Screening and Toxicity Studies of *Crassocephalum rubens* (Juss. ex Jacq.) S. Moore and *Crassocephalum crepidioides* (Benth.) S. Moore Consumed as Vegetable in Benin, *International Journal of Current Microbioogy and Applied Science 2*(8):11.

Adjibode A.G., U.P. Tougan, A.K.I. Youssao, G.A. Mensah, Ch. Hanzen, & G.B. Koutinhouin, 2015, *Synedrella nodiflora* (L.) Gaertn: A Review on its Phytochemical Screening and Uses in Animal Husbandry and Medicine, *International Journal of Advanced Scientific and Technical Research* 5(3) : 440.

Ali, S., S. Zameer, & M. Yaqoob, 2017, Ethnobotanical, Phytochemical and Pharmacological Properties of *Galinsoga Parviflora* (Asteraceae): A Review, *Tropical Journal of Pharmaceutical Research* 16 (12): 3028.

Bartolome, A. P., I.M. Villaseñor, & Wen-Chin Yang, 2013, *Bidens pilosa* L. (Asteraceae): Botanical Properties, Traditional Uses, Phytochemistry, and Pharmacology, *Hindawi Publishing Corporation*.

Bhattacharyya, B. & B.M. Johri, 1998, *Flowering Plants : Taxonomy and Phylogeny,* Springer-Verlag, New York, p. 526-528.

Botsaris, A.S., 2007, Plants Used Traditionally to Treat Malaria in Brazil: The Archives ofFlora Medicinal, *Journal of Ethnobiology and Ethnomedicine* 3 (18) : 3, 5.

Ceng, S., M.Y. Barakatun-Nisak, J. Anthony, & A. Ismail, 2015, Potential Medicinal Benefits of *Cosmos caudatus* (Ulam Raja): A Scoping Review, *Journal of Research in Medical Science* 20 (10): 1000.

Chatterjee, M. & A. Mukherjee, 2014, *Elephantopus scaber* L: 1. An Overview, *Indian J.L.Sci.* 4 (1) : 52.

Ebadi, M., 2006, *Pharmacodynamic Basis of Herbal Medicine*, The Taylor & Francis Group, America, p.285.

Hidayat, S., S. Wahyuni, & S. Andalusia, 2008, *Seri Tumbuhan Obat Berpotensi Hias*, PT. Elex Media Kopuntindo, Jakarta, p. 44, 77, 100, 101.

Lima G. M., R.l R. Bonfi m, M.R. Silva, S.M. Thomazzi, M.R.V. Santos, L.J. Quintans-Júnior, L.R. Bonjardim, & A. A. S. Araújo, 2011, Assessment of Antinociceptive and Antiinflammatory Activities of *Porophyllum ruderale* Aqueous Extract, *Rev. Bras. Farmacogn. Braz. J. Pharmacogn* 21(3):488

Munhoza, V. M., R. Longhinia, J. R.P. Souzab, J. A.C. Zequic, E.V.S. Leite Mellod, G. C. Lopesa, J.C.P. Melloa, 2014, Extraction of Flavonoids from *Tagetes patula*: Process Optimization and Screening for Biological Activity, *Brazilian Journal of Pharmacognosy* 24 :576.

Mst. Munira S., Md. H. Kabir, I. J. Bulbul, Mst. L. Nesa, Md. A. M., & I. Haque, 2018, Pharmacological Activities of *Youngia japonica* Extracts, *Annual Research & Review in Biology* 25(5):12.

Mursito, B. & H. Prihmantoro, 2011., *TanamanHias Berkhasiat Obat*, Penebar Swadaya, Bogor, p. 51-52.

Njoroge, N.G., Bussmann, W. Rainer, Gemmill, Barbara,Newton, L. Eric, & N. Victoria W., 2004, Utilisation Of Weed Species As Sources Of Traditional Medicines In Central Kenya, *Lyonia*,p.10

Putra, B.R.S., D. Kusrini., & E. Fachriyah, 2013, Isolasi Senyawa Antioksidan dari Fraksi Etil Asetat Daun Tempuyung (*Sonchus arvensis L*), *Jurnal Kimia Sains dan Aplikasi* 16 (3) : 69.

Quattrocchi, U., 2016, *CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology*, CRC Press, Boca Raton, p. 57, 1107, 1666.

Rahman, M. M., S. A. Khan, G.M. Hosain, Md. Jakaria, & Md.A. Rahim, 2016, Acmella radicans (Jacq.) R.K. Jansen (Asteraceae) – A New Angiospermae Recort for Bangladesh, *Jahangirnagar University J. Biol. Sci* 5 (1): 91.

Rajalakshmi P., Sumathi V., &Pugalenthi M., 2016, Antioxidant activity of *Erigeron Karvinskianus* DC. and *Ageratina Adenophora* (Spreng.) King (leaves), *International Journal of Food Science and Nutrition* 1 (5): 64.

Rayburn, D. J., 2007, *Let's Get Natural with Herbs*, Zark Mountain Publishing, United States of America, p. 216.

Redaksi Agro Media, 2008, *Buku Pintar Tanaman Obat*, PT. Agromedia Pustaka, Jakarta Selatan, p. 134.

Simanjuntak, H.A., 2017, Potensi Famili Asteraceae Sebagai Obat Tradisional di Masyarakat Etnis Simalungun Kabupaten Simalungun Provinsi Sumatera Utara, *BioLink* 4(1):14.

Supriyatna, V. Wijaya, N. Naspiah, & A. Apriliana, 2014, *Herbalisme dan Leksikon Herbal*, Deepublish, Yogyakarta, p. 88.

Wahlerberg, J.E., P. Esner, L. Kanerva, H.I. Maibach, 2012, *Management of Positive Patch Tets Reaction,* Springer, New York, p.99.

Wang, J., Z.Yu, C. Wang, X.Tian, X. Huo, Y. Wang, C. Sun, L. Feng, J. Ma, B. Zhang, Q. Yang, X. Ma, Y. Xu, 2017, Dehydrocostus lactone, a Natural Sesquiterpene lactone, Suppresses the Biological Characteristics of Glioma, through Inhibition of the NF-*κ*B/COX-2 Signaling Pathway by Targeting IKKβ, *Am J Cancer Res* 7(6):1270.

Wijayakusuma, H., 2000, *Ensiklopedia Milenium Tumbuhan Berkhasiat Obat Indonesia Jilid 1*, PT. Prestasi Insan Indonesia, Jakarta, p. 112.

Zhang, X., Z. Liu, X. Bi, J. Liu, W. Li, Y. Zhao, 2013, Flavonoids and its Derivatives From *Callistephus chinensis* Flowers and Their Inhibitory Activities Against *A*-Glucosidase, *EXCLI Journal* 12: 964.